

LEVEL

SUSQUEHANNA RIVER BASIN
RED RUN, LYCOMING COUNTY
PENNSYLVANIA

(12)

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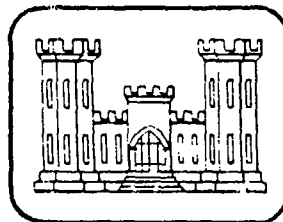
MAGGIO ESTATE DAM No. 2

NDI No. PA01120
PennDER No. 41-103
Dam Owner: Estate of Michael Maggio

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PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

PA CW 31-81-C-0011



prepared for

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

prepared by
MICHAEL BAKER, JR., INC.

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AUGUST 1981

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PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Maggio Estate Dam No. 2, Lycoming County, Pennsylvania
NDI No. PA 01120, PennDER No. 41-103
Red Run
Inspected 31 March 1981

ASSESSMENT OF
GENERAL CONDITIONS

Maggio Estate Dam No. 2 is owned by the Estate of Michael Maggio and is classified as a "Significant" hazard - "Small" size dam. The dam was found to be in fair overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway capacity is less than the inflow to the impoundment during the 100-year flood. A spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum Flood (1/2 PMF) is required for Maggio Estate Dam No. 2. Because the dam is on the low end of the "Small" size category in terms of height and storage capacity, the 100-year flood was chosen as the SDF. The spillway is therefore considered "Inadequate." It is recommended that the owner develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.

The inspection revealed certain items of remedial work which should be performed by the owner without delay. These include:

- 1) Develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.
- 2) Fill and seed the tire ruts on the crest of the dam.
- 3) Excavate, fill, compact and seed the animal burrow on the upstream face of the dam.
- 4) Monitor the seeps beneath the spillway and at the toe of the embankment left of the spillway at regular intervals and during periods of high reservoir levels for turbidity or increase in flow, which may indicate potential for the piping of embankment material. If turbidity or increased flows are noted, a qualified geotechnical engineer should be retained to recommend remedial measures.

MAGGIO ESTATE DAM NO. 2

- 5) Provide erosion protection for the earth sides of the spillway.
- 6) Fill the downstream edge of the spillway and provide with erosion protection.
- 7) Clear the debris from around the 12-inch concrete outlet pipe and provide a trash rack for the pipe inlet.
- 8) Cut all trees at the toe of the embankment at ground level. All trees with a trunk diameter greater than 3 inches should have their root systems removed. All resultant areas of erosion and cavities should be filled, graded, compacted and seeded.
- 9) Provide for emergency drawdown of the reservoir.

In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rainfall, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, activate the emergency operation and warning system.

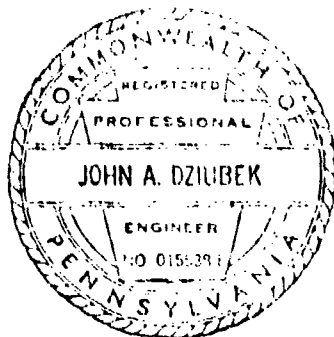
It is further recommended that formal inspection, maintenance, and operational procedures and records be developed and implemented. These should be included in a formal maintenance and operations manual for the dam.

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MAGGIO ESTATE DAM NO. 2

Submitted by:

MICHAEL BAKER, JR., INC.



John A. Dziubek
John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 20 August 1981

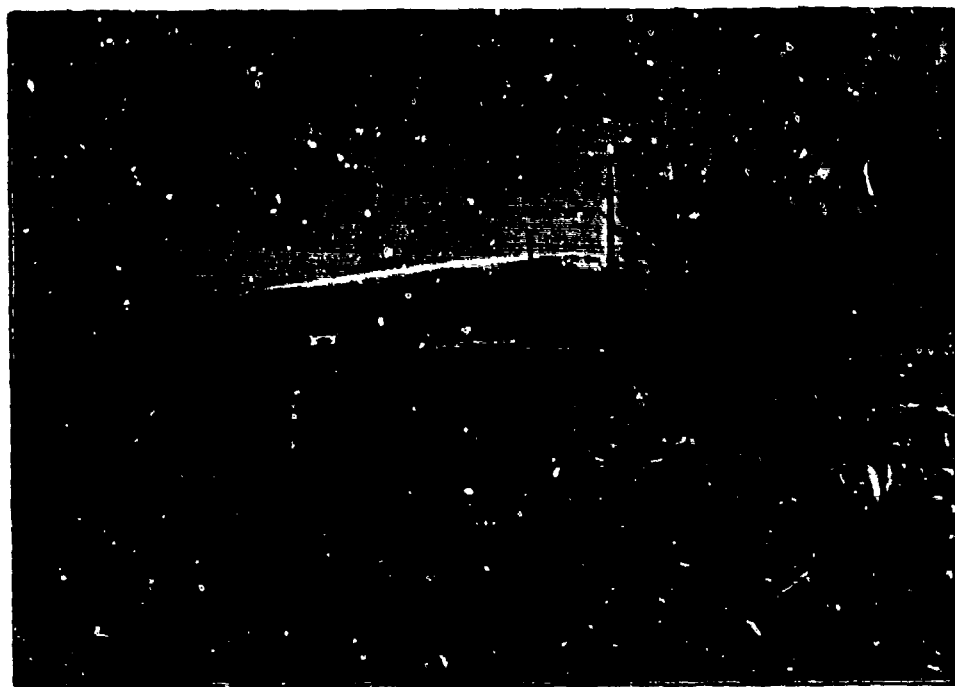
Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck
JAMES W. Peck
Colonel, Corps of Engineers
District Engineer

Date: 31 Aug 81

MAGGIO ESTATE DAM NO. 2



Overall View From Right Abutment



Overall View of Left Half of Dam From Dam Center

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
MAGGIO ESTATES DAM NO. 2
NDI NO. PA 01120, PennDER No. 41-103

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.
- b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances - Maggio Estate Dam No. 2 is an earthfill embankment 872 feet long and 28.9 feet high. The embankment has a crest width that varies from 15 to 31 feet and side slopes of from 1.6H:1V to 2.2H:1V (Horizontal to Vertical) upstream and 2.1H:1V downstream. The upstream face of the embankment is protected with riprap. The left half of the dam separates this pond from another smaller pond downstream.

The spillway, located at the right abutment, consists of a concrete broad-crested weir which is 38 feet long perpendicular to the direction of flow. The unprotected earth sides of the spillway extend 1.5 feet above the crest of the weir.

The outlet pipe, located near the left abutment, is a 12-inch concrete pipe which equalizes the water surface between this lake and the one immediately downstream at low flows.

The dam is located in an area that has been extensively strip mined and appears to have been built from material from these mining operations.

- b. Location - Maggio Estate Dam No. 2 is located on Red Run, a tributary to Lycoming Creek in McIntyre Township, Lycoming County, Pennsylvania. The dam is approximately 1.89 miles northwest of Ralston in McIntyre Township. The coordinates of the dam are N 41° 31.7' and W 76° 58.5'. The dam can be found on the USGS 7.5 minute topographic quadrangle, Ralston, Pennsylvania.

- c. Size Classification - The height of the dam is 28.9 feet. Storage at the top of the dam [Elevation 1641.5 feet Mean Sea Level (ft. M.S.L.)] is 329 acre-feet. Therefore, the dam is in the "Small" size category.
- d. Hazard Classification - If the dam should fail, economic damage is likely to result to Route 14 and to a trailer in Ralston, which is 4 to 6 feet above the streambed and 10,800 feet downstream. Loss of life may occur; therefore, the dam is considered to be in the "Significant" hazard category.
- e. Ownership - The dam is owned by the Estate of Michael Maggio, c/o Robert J. Woillett, Attorney at Law, 416 Pine Street, Williamsport, Pennsylvania 17701.
- f. Purpose of Dam - The impoundment created by the dam is used for recreation and fishing.
- g. Design and Construction History - Maggio Estate Dam No. 2 was built by Michael Maggio about 1953.
- h. Normal Operational Procedures - The reservoir is typically maintained at the spillway crest, elevation 1640.0 ft. M.S.L.

1.3 PERTINENT DATA

- a. Drainage Area (square miles) - 1.08
- b. Discharge at Dam Site (c.f.s.) -

Maximum Flood	Unknown
Spillway Capacity at Maximum Pool (El. 1641.5 ft. M.S.L.) -	220
- c. Elevation* [feet above Mean Sea Level (ft. M.S.L.)] -

Design Top of Dam -	Unknown
Minimum Top of Dam -	1641.5
Maximum Design Pool -	Unknown
Spillway Crest -	1640.0
Streambed at Toe of Dam -	1612.6
Maximum Tailwater of Record -	Unknown

*All elevations are referenced to the spillway crest, El. 1640.0 ft. M.S.L., as estimated from the USGS 7.5 minute topographic quadrangle, Ralston, Pennsylvania.

- d. Reservoir (feet) -
- | | |
|---|--------|
| Length of Maximum Pool
(El. 1641.5 ft. M.S.L.) - | 1050.0 |
| Length of Normal Pool
(El. 1640.0 ft. M.S.L.) - | 1150.0 |
- e. Storage (acre-feet) -
- | | |
|---------------------------------------|-------|
| Top of Dam (El. 1641.5 ft. M.S.L.) - | 329.0 |
| Normal Pool (El. 1640.0 ft. M.S.L.) - | 290.0 |
- f. Reservoir Surface (acres) -
- | | |
|---------------------------------------|------|
| Top of Dam (El. 1641.5 ft. M.S.L.) - | 27.0 |
| Normal Pool (El. 1640.0 ft. M.S.L.) - | 25.0 |
- g. Dam -
- | | |
|--------------------------|--------------------|
| Type - | Earthfill |
| Total Length (feet) - | 872.0 |
| Height (feet) - Design - | Unknown |
| Field - | 28.9 |
| Top Width (feet) - | Varies from 15-81 |
| Side Slopes - Upstream - | 1.6H:1V to 2.2H:1V |
| Downstream - | 2.1H:1V |
| Zoning - | Unknown |
| Impervious Core - | Unknown |
| Cut-off - | Unknown |
| Drains - | Unknown |
- h. Diversion and Regulating Tunnels -
- | | |
|--|------|
| | None |
|--|------|
- i. Spillway -
- | | |
|---|--------|
| Type - Broad-crested weir | |
| Location - Right abutment | |
| Length of Crest Perpendicular to
Flow (feet) - | 38.0 |
| Crest Elevation (ft. M.S.L.) - | 1640.0 |
| Gates - | None |
| Downstream Channel - Steep and narrow | |
- j. Outlet Works - 12-inch concrete pipe used to equalize the water surface between this impoundment and the one immediately downstream.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Information reviewed for preparation of this report consisted of the Pennsylvania Department of Environmental Resources' (PennDER) File No. 41-103. This included:

- 1) The report submitted by General Analytics, Inc., on Ralston Sizing and Preparation Area which includes Maggio Estate Dam No. 2. The report relates general information about the ponds in the Maggio Estate and their general condition.
- 2) Notice of Violation to Maggio Estate c/o Robert J. Wollet from Division of Dams and Encroachments stating the deficiencies and corrective measures needed to the dam dated 17 July 1975.
- 3) Various correspondence between Robert J. Wollet and Dams Safety Section, Division of Dams and Encroachments, deciding to retain an engineer to design a 40-foot concrete spillway for Maggio Estate Dam No. 2 and to breach the upstream dam.
- 4) Plans submitted by English Engineering Corporation, Williamsport, Pennsylvania, for the proposed spillway reconstruction, dated 4 June 1976.
- 5) Permit issued by the Water and Power Resources Board, allowing the reconstruction of the dam (dated 27 July 1976).
- 6) Letters from Lewis Meuse and Congressman Allen E. Ertel expressing concern over the condition of the Maggio Estate Dam No. 2 (dated 6 and 23 January 1978).
- 7) Letter, dated 10 May 1978, to Robert J. Wollet, from the Dams Safety Section, requesting the water surface be lowered several feet.
- 8) Inspection report by a representative of the Division of Dam Safety, stating no effort had been made to permanently lower the pool elevation by 2 feet, and that considerable seepage was noticed below the dam to the left of the spillway (dated 18 September 1979).

2.2 CONSTRUCTION

The dam was constructed by Michael Maggio in about 1953. The spillway was rebuilt in 1976.

2.3 OPERATION

No formal records are available for operation of the dam and reservoir. The spillway is uncontrolled and the reservoir is typically at the spillway crest level.

2.4 EVALUATION

- a. Availability - The information reviewed is readily available from PennDER File No. 41-103.
- b. Adequacy - The information available, combined with the visual inspection measurements and observations, is adequate for a Phase I Inspection of this dam.
- c. Validity - There is no reason at the present time to doubt the validity of the available engineering data.

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The dam was constructed by Michael Maggio in about 1953. The spillway was rebuilt in 1976.

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No formal records are available for operation of the dam and reservoir. The spillway is uncontrolled and the reservoir is typically at the spillway crest level.

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- b. Adequacy - The information available, combined with the visual inspection measurements and observations, is adequate for a Phase I Inspection of this dam.
- c. Validity - There is no reason at the present time to doubt the validity of the available engineering data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

- a. General - The dam was found to be in fair overall condition at the time of inspection on 31 March 1981. No unusual weather conditions were experienced during the inspection. Noteworthy deficiencies observed during the visual inspection are described briefly in the following paragraphs. The complete visual inspection checklist, field sketch, top of dam profile, and typical cross-section are presented in Appendix A.
- b. Embankment - Tire ruts are located on the crest of the left section of the embankment. A rodent hole is located on the upstream face near the left abutment. Low brush and a few small trees are growing on the embankment. About 200 feet left of the spillway at the downstream toe of the embankment, a clear seep of approximately 0.25 g.p.m. was observed.
- c. Appurtenant Structures - The sides of the spillway are earth with no erosion protection. The downstream edge and sides of the concrete spillway are eroded and undermined. A clear seep of approximately 5 g.p.m. was observed at the downstream end of the concrete spillway. The earth discharge channel has very little erosion protection. Debris is collecting near the entrance of the 12-inch concrete outlet pipe.
- d. Reservoir Area - The reservoir slopes are gentle and no sign of instability was observed. There appeared to be a small amount of sedimentation near the upper end of the reservoir.

Upstream 600 feet from Maggio Estate Dam No. 2 is a 300-foot long, 10-foot high embankment that has been breached. Upstream 5000 feet from Maggio Estate Dam No. 2 is a small impoundment with an embankment 400 feet long and 8 feet high. The spillway is a 15-inch corrugated metal pipe.

- e. Downstream Channel - The channel passes through a steep and narrow valley before reaching Ralston. Route 14 crosses the downstream channel at Ralston. There is also a mobile home located next to the downstream channel in Ralston, 4 to 6 feet above the streambed. Below the dam at the outlet pipe is another small impoundment with an embankment height of 25 feet.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal procedures for operating the reservoir or evacuating the downstream area in case of an emergency. It is recommended that formal emergency procedures be adopted, prominently displayed and furnished to all operating personnel.

4.2 MAINTENANCE OF DAM

There are no formal records of maintenance or formal procedures for evaluating the necessity of maintenance for the structure. It is recommended that formal inspection procedures be developed.

4.3 MAINTENANCE OF OPERATING FACILITIES

Maintenance is unscheduled. It is recommended that a formal operation and preventive maintenance schedule be developed and implemented.

4.4 DESCRIPTION OF ANY WARNING SYSTEM

There is no warning system in the event of dam failure. It is recommended that an emergency warning system be developed.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

The current operational procedures are inadequate. It is recommended that a formal maintenance and operations manual be prepared for the dam.

SECTION 5 - HYDRAULIC/HYDROLOGY

5.1 EVALUATION OF FEATURES

- a. Design Data - No hydrologic or hydraulic design calculations are available for Maggio Estate Dam No. 2.
- b. Experience Data - No information concerning the effects of significant floods on the dam is available.
- c. Visual Observation - The sides of the spillway are made of unprotected earthfill which will erode during periods of high flow, causing the embankment to fail adjacent to the spillway. These training walls should be provided with some type of erosion protection.

Located upstream from Maggio Estate Dam No. 2 are two impoundments; both dams have been breached but the dam furthest upstream has a breached section that was rebuilt. Both impoundments are not considered to have a significant effect on Maggio Estate Dam No. 2.

- d. Overtopping Potential - Maggio Estate Dam No. 2 is a "Small" size - "Significant" hazard dam requiring evaluation for a spillway design flood (SDF) in the range of the 100-year flood to the 1/2 Probable Maximum flood (1/2 PMF). Because the dam is on the lower end of the "Small" size category in terms of storage capacity, the 100-year flood was chosen as the SDF.

Using material from "The Hydrologic Study - Tropical Storm Agnes" prepared by the Corps of Engineers in New York City, the peak inflow to the impoundment for the 100-year flood was calculated to be 1420 c.f.s. The peak inflow to the impoundment for the 100-year flood was also calculated to be 600 c.f.s., using material from "Water Resources Bulletin, Bulletin No. 13, Floods in Pennsylvania", prepared by the Department of Environmental Resources, Commonwealth of Pennsylvania. Averaging these two methods produced a peak inflow of 1010 c.f.s., which was used in this analysis.

The spillway capacity at the minimum top of dam is 220 c.f.s., which is approximately 22 percent of the peak inflow to the impoundment from the 100-year flood.

- e. Spillway Adequacy - As outlined in the above analysis, the spillway capacity is less than the peak inflow to the impoundment during the 100-year flood; therefore, the spillway is considered "Inadequate".

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations - A seep at the toe of the embankment and one from under the concrete weir were flowing clear at 0.25 g.p.m. and 5 g.p.m., respectively. These seeps should be monitored at regular intervals and during periods of high reservoir levels for turbidity or increase in flow, which may indicate potential for the piping of embankment material. If turbidity or increased flows are noted, a qualified geotechnical engineer should be retained to recommend remedial measures.
- b. Design and Construction Data - Calculations of slope and structural stability were not available for review. The slopes have had a history of satisfactory performance. In view of the modest height of the dam, a history of satisfactory performance of its slopes, and no signs of distress observed during the visual inspection, no further stability analysis is deemed necessary.
- c. Operating Records - Nothing in the operational information indicates concern relative to the structural stability of the dam.
- d. Post-Construction Changes - No changes adversely affecting the structural stability of the dam have been performed.
- e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States", Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of minor seismic activity. Therefore, further consideration of the seismic stability is not warranted since the dam is considered to be structurally stable.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Safety - Maggio Estate Dam No. 2 was found to be in fair overall condition at the time of inspection. The dam is a "Significant" hazard - "Small" size dam requiring a spillway capacity in the range of the 100-year flood to the 1/2 PMF. The 100-year flood was chosen as the SDF because the dam is on the low end of the "Small" size category, based on the height and storage capacity. As presented in Section 5, the spillway capacity is less than the peak inflow to the impoundment during the 100-year flood. Therefore, the spillway is considered "Inadequate."
- b. Adequacy of Information - The information available and the observations and measurements made during the field inspection are considered sufficient for this Phase I Inspection Report.
- c. Urgency - The owner should initiate the remedial measures discussed in paragraph 7.2 as soon as practicable.
- d. Necessity for Additional Data/Evaluation - The hydraulic/hydrologic analysis performed in connection with this Phase I Inspection Report has indicated the need for additional spillway capacity. It is recommended that the owner develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed by the owner without delay. These include:

- 1) Develop remedial measures to ensure that the dam will not be overtopped by the 100-year flood.
- 2) Fill and seed the tire ruts on the crest of the dam.
- 3) Excavate, fill, compact and seed the animal burrow on the upstream face of the dam.

- 4) Monitor the seeps beneath the spillway and at the toe of the embankment left of the spillway at regular intervals and during periods of high reservoir levels for turbidity and/or increase in flow, which may indicate potential for the piping of embankment material. If turbidity and/or increased flows are noted, a qualified geotechnical engineer should be retained to recommend remedial measures.
- 5) Provide erosion protection for the earth sides of the spillway.
- 6) Fill downstream edge of the spillway and provide with erosion protection.
- 7) Clear the debris from around the 12-inch concrete outlet pipe and provide trash rack for pipe inlet.
- 8) Cut all trees at the toe of the embankment at ground level. All trees with a trunk diameter greater than 3 inches should have their root systems removed. All resultant areas of erosion and cavities should be filled, graded, compacted and seeded.
- 9) Provide for emergency drawdown of the reservoir.

In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rainfall, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operational procedures and records be developed and implemented. These should be included in a formal maintenance and operations manual for the dam.

APPENDIX A

**VISUAL INSPECTION CHECK LIST, FIELD SKETCH,
TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION**

Check List
Visual Inspection
Phase 1

Name of Dam Maggio Estate Dam No. 2 County Lycoming State Pennsylvania Coordinates Lat. N 41°31.7'
 NDI # PA 01120
 PennDER # 41-103 Long. W 76°58.5'

Date of Inspection 31 March 1981 Weather Sunny Temperature 70°

Pool Elevation at Time of Inspection 1638.8 ft. *M.S.L. Tailwater at Time of Inspection 1631.9 M.S.L.

*All elevations are referenced to the spillway crest, El. 1640.0 ft. M.S.L., as estimated from the U.S.G.S. 7.5 minute topographic quadrangle, Kalston, Pennsylvania.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
 Jeff L. Sawyer
 Gary W. Todd

Owner's Representatives:

Gary W. Todd Recorder

CONCRETE/MASONRY DAMS Not Applicable

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

LEAKAGE

STRUCTURE TO
ABUTMENT/EMBANKMENT
JUNCTIONS

DRAINS

WATER PASSAGES

FOUNDATION

CONCRETE/MASONRY DAMS Not Applicable

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS		
CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

EMBANKMENT

Name of Dam MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed	

EMBANKMENT

Name of Dam MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal and vertical alignment is good. Tire ruts are located at the left end of the crest. A rodent hole is in the upstream embankment near Station 1+75.	Fill and reseed the tire ruts. Fill, compact and seed the rodent hole.

RIPRAP FAILURES

None observed

VEGETATION

Low brush and a few small trees are growing on the embankment and at the toe near the right abutment.

Cut all trees and brush on the embankment and for ten ft. beyond the toe of the dam.

EMBANKMENT

Name of Dam MAGGIO ESTATE DAM NO. 2NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good condition	
ANY NOTICEABLE SEEPAGE	Seep under concrete weir (approximately 5 g.p.m.). Seep at toe approximately 200 ft. left of spillway (approximately 0.25 g.p.m.).	Monitor seeps at regular intervals.

STAFF GAGE AND RECORDER

None observed

DRAINS

None observed

OUTLET WORKS

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	A 12-in. concrete pipe is near the left abutment between the two ponds. This pipe is two ft. below the surface of each pond. Debris was blocking the entrance to this pipe.	Used to equalize the surface elevation between the two ponds. Clear debris from the pipe.

INTAKE STRUCTURE

None

OUTLET STRUCTURE

None

OUTLET CHANNEL

None

EMERGENCY GATE

None

UNGATED SPILLWAY

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete broad-crested weir, with earth sides. Seep of approximately 5 g.p.m. coming from under weir. Erosion and undermining of the downstream edge of concrete.	Provide erosion protection for earth sides and monitor seep.
APPROACH CHANNEL	No problems observed	
DISCHARGE CHANNEL	Earth discharge channel with very little riprap protection.	Provide riprap protection to reduce erosion from high flows over spillway.
BRIDGE AND PIERS	None	

GATED SPILLWAY Not applicable

Name of Dam: MAGGIO ESTATE DAM NO. 2
NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CONCRETE SILL

APPROACH CHANNEL

DISCHARGE CHANNEL

BRIDGE AND PIERS

GATES AND OPERATION
EQUIPMENT

INSTRUMENTATION

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
--------------------	--------------	----------------------------

MONUMENTATION/SURVEYS	None observed	
-----------------------	---------------	--

OBSERVATION WELLS	None observed	
-------------------	---------------	--

WEIRS	None observed	
-------	---------------	--

PIEZOMETERS	None observed	
-------------	---------------	--

OTHER	None	
-------	------	--

RESERVOIR

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

SLOPES

Gentle slopes well covered with vegetation.

SEDIMENTATION

There appeared to be a minor amount of sedimentation.

UPSTREAM DAMS

There are two upstream dams. The first is 600 ft. upstream and has an embankment 300 ft. long and 10 ft. high. The embankment has been breached. The second embankment is 500 ft. upstream and has an embankment 400 ft. long and 8 ft. high. The spillway is a 15-in. corrugated metal pipe.

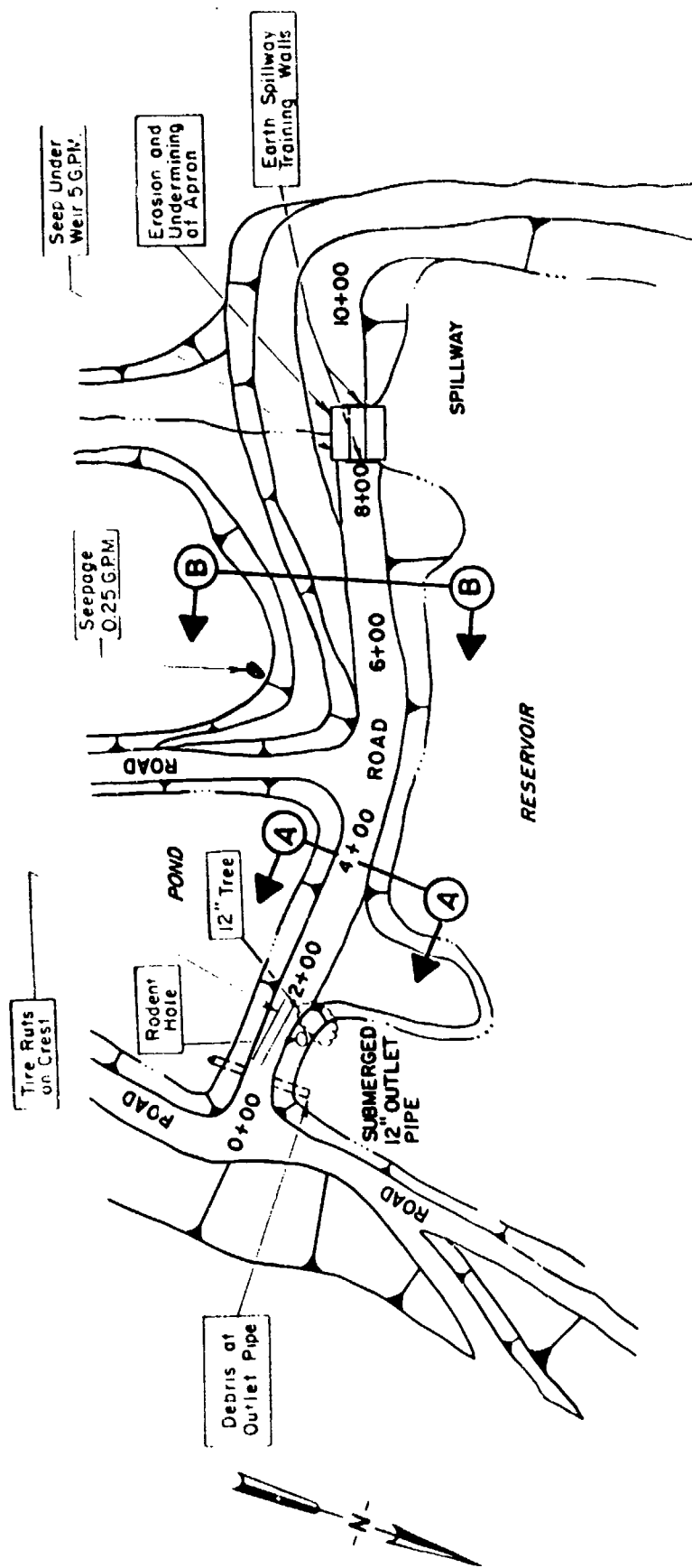
DOWNSTREAM DAMS

Downstream are several small impoundments, all of which have approximately the same water surface elevation. The water surface is equalized between the impoundments with pipes through the embankment to the adjacent impoundment.

DOWNSTREAM CHANNELName of Dam: **MAGGIO ESTATE DAM NO. 2**

NDI # PA 01120

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream area is a steep narrow valley.	
SLOPES	Steep slopes with good ground cover and trees.	
APPROXIMATE NO. OF HOMES AND POPULATION	One mobile home, approximately 4 to 6 ft. above the stream bed, is located 10,800 ft. downstream from the dam. Just downstream from the home a small bridge on Route 14 crosses the stream.	Economic damage is likely to to the home and highway. Loss of life may occur.



FIELD SKETCH

MAGGIO ESTATE DAM NO. 2
 NDI NO. PA01120
 PENN. NO. 41-103
 SCHEMATIC - NOT TO SCALE

CROSS SECTION TAKEN AT SECTIONS A-A AND B-B

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15006

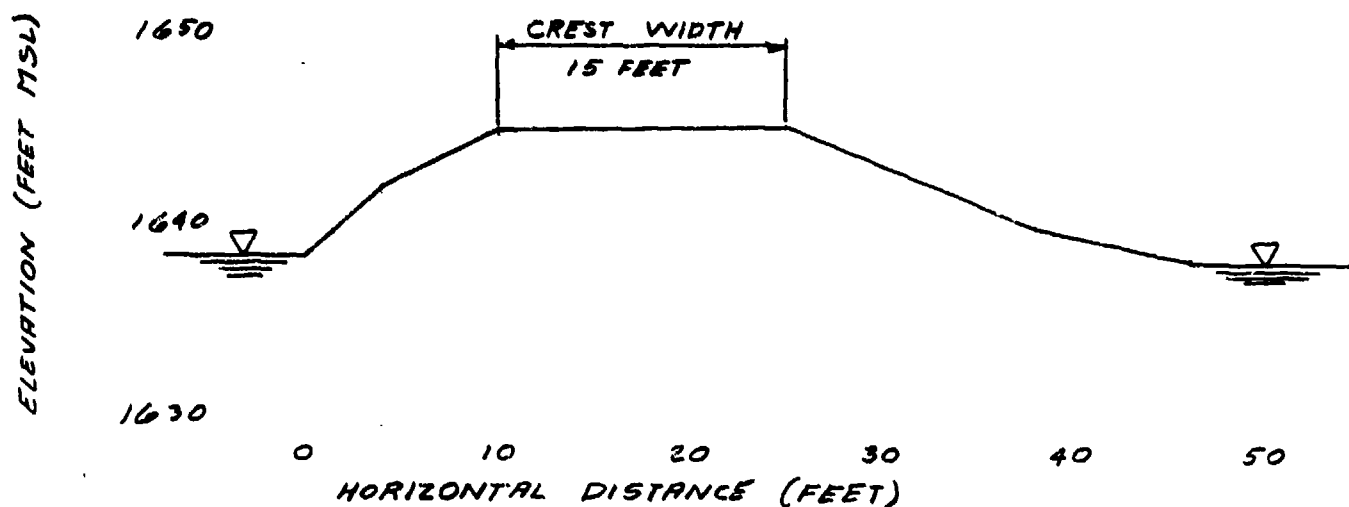
MAGGIO ESTATE DAM No. 2

TOP OF DAM PROFILE
TYPICAL CROSS-SECTION

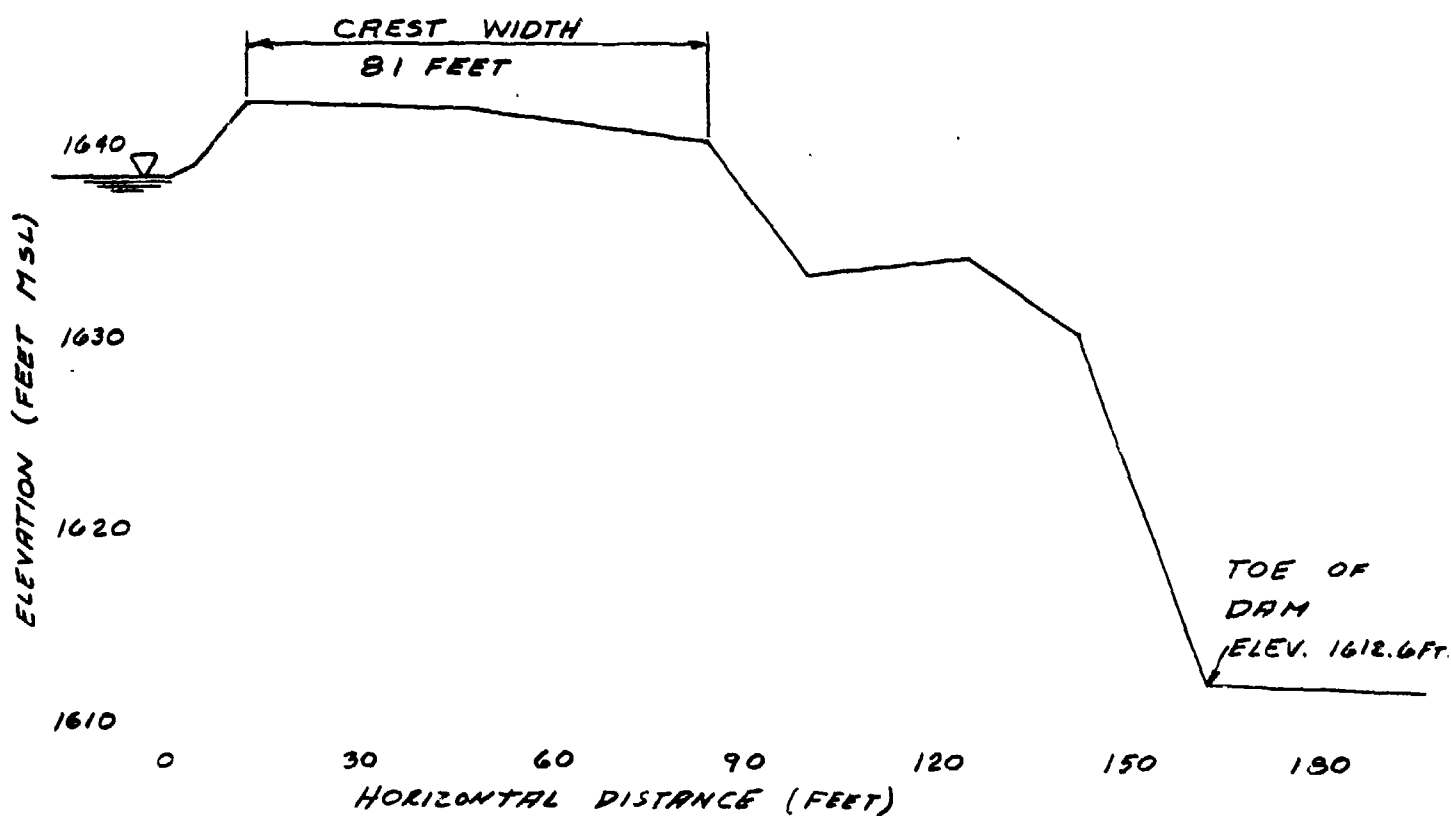
DATE OF INSPECTION: 31 March 1981

A-14

TYPICAL CROSS SECTION AT
SECTION A-A



TYPICAL CROSS SECTION AT SECTION B-B



APPENDIX B
ENGINEERING DATA CHECK LIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

ITEM	REMARKS
PLAN OF DAM	See field sketch (Page A-13) of this report.
REGIONAL VICINITY MAP	A U.S.G.S. 7.5 minute topographic quadrangle, Ralston, Pennsylvania, was used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	The dam was constructed by Michael Maggio in about 1953. The spillway was reconstructed in 1976.
TYPICAL SECTIONS OF DAM	See Appendix D, Sheet 5 of this report.
HYDROLOGIC/HYDRAULIC DATA	No information available.
OUTLETS - PLAN	
- DETAILS	None
- CONSTRAINTS	None
- DISCHARGE RATINGS	No information available
RAINFALL/RESERVOIR RECORDS	No records are maintained.

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	No geology reports are available for the dam. See Appendix F for the Regional Geology.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	A post-construction report dated 24 March 1975 is available in the Penndder file.
BORROW SOURCES	No information available

Name of Dam: MAGGIO ESTATE DAM NO. 2

NDI # PA 01120

REMARKS**ITEM****MONITORING SYSTEMS**

None

MODIFICATIONS

The spillway was rebuilt in 1976.

HIGH POOL RECORDS

No information available

**POST-CONSTRUCTION ENGINEERING
STUDIES AND REPORTS**

The latest inspection report, conducted 18 September 1979, by Penndder, found seepage below and to the left of the spillway.

**PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS**

None reported in the available information.

**MAINTENANCE
OPERATION
RECORDS**

No formal records of maintenance are kept.

Name of Dam: MAGGIO ESTATE DAM NO. 2
NDI # PA 01120

<u>ITEM</u>	<u>REMARKS</u>
-------------	----------------

SPILLWAY PLAN,	See Plates 3, 4, and 5 of this report.
----------------	--

SECTIONS,
and
DETAILS

OPERATING EQUIPMENT
PLANS & DETAILS

None

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Primarily forested and reclaimed
stripped land.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1640.0 Ft. M.S.L.
(290 Ac.-Ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1641.5 Ft. M.S.L.
(329 Ac.-Ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1641.5 Ft. (Minimum top of dam)

SPILLWAY: Trapezoidal channel with concrete weir and earth sides

- a. Crest Elevation 1640.0 Ft. M.S.L.
- b. Type Broad-crested weir
- c. Width of Crest Parallel to Flow 4.0 Ft.
- d. Length of Crest Perpendicular to Flow 38 Ft.
- e. Location Spillover Right abutment.
- f. Number and Type of Gates None

OUTLET WORKS: _____

- a. Type 12-in. pipe
- b. Location Near left abutment
- c. Entrance Inverts 1636.8 ft. M.S.L.
- d. Exit Inverts 1636.0 ft. M.S.L.
- e. Emergency Drawdown Facilities None

HYDROMETEOROLOGICAL GAGES: None

- a. Type _____
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C
PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam

Top Photo - Overall View From Right Abutment
(OV-T)

Bottom Photo - Overall View of Left Half of Dam From
(OV-B) Dam Center

Photograph Location Plan

Photo 1 - View of Downstream Side of Spillway

Photo 2 - View of Left Downstream Side of Spillway

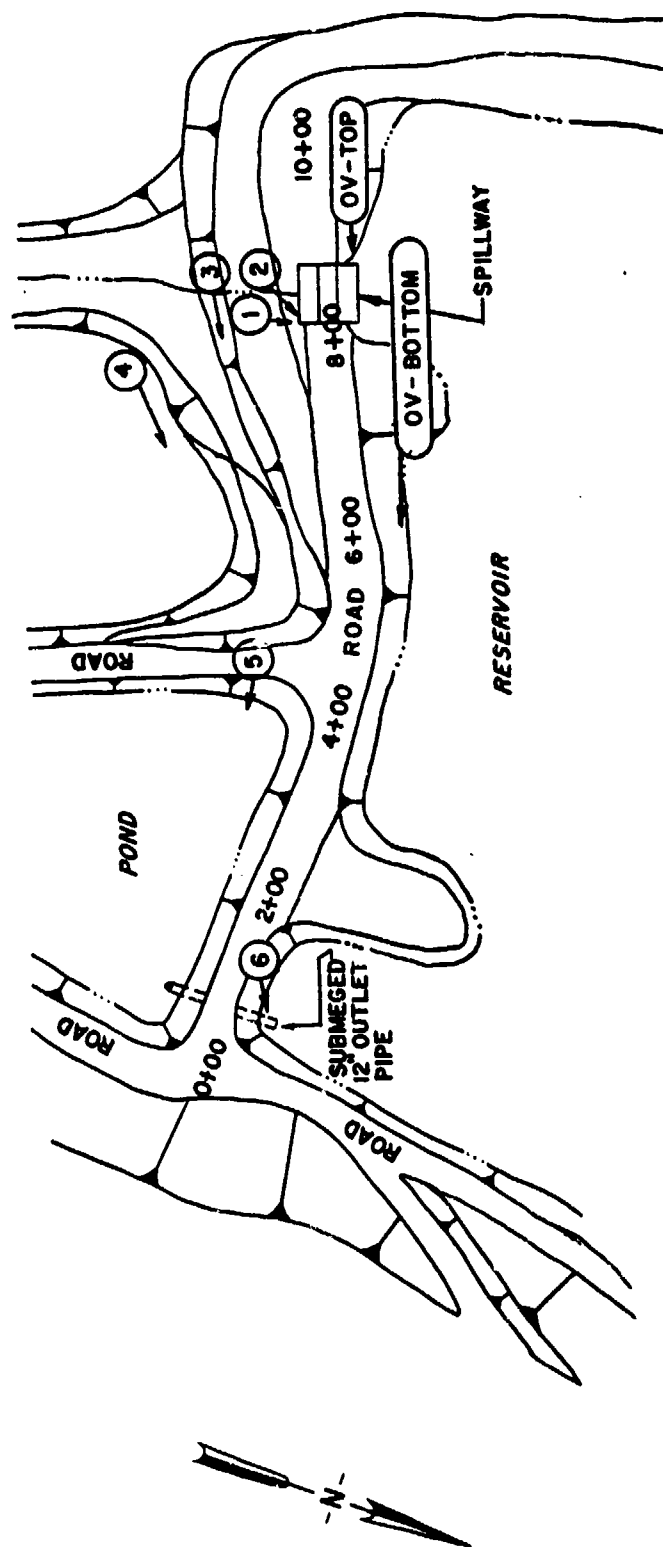
Photo 3 - View of Right Section of Embankment (Upper
Downstream Portion)

Photo 4 - View of Right Section of Embankment (Lower
Downstream Portion)

Photo 5 - View of Downstream Slope of Left Half of Dam
From Dam Center

Photo 6 - View of Outlet Pipe Located at Left Abutment
of Dam

Note: Photographs were taken on 31 March 1981.



PHOTOGRAPH
 LOCATION PLAN
 MAGGIC ESTATE DAM NO. 2
 NDI NO. PA01120
 PENNDER NO. 41-103
 Photographs Taken 31 March 1981

MAGGIO ESTATE DAM NO. 2



PHOTO 1. View of Downstream Side of Spillway



PHOTO 2. View of Left Downstream Side of Spillway

MAGGIO ESTATE DAM NO. 2



**PHOTO 3. View of Right Section of Embankment
(Upper Downstream Portion)**



**PHOTO 4. View of Right Section of Embankment
(Lower Downstream Portion)**

MAGGIO ESTATE DAM NO. 2



PHOTO 5. View of Downstream Slope of Left Half of Dam From Dam Center



PHOTO 6. View of Outlet Pipe Located at Left Abutment of Dam

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MAGGIO ESTATE DAM No. 2 S.O. No. _____
APPENDIX D - HYDROLOGIC AND Sheet No. _____ of _____
HYDRAULIC CALCULATIONS Drawing No. _____
Computed by _____ Checked by _____ Date _____

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
PREFACE	i
HYDRAULIC DATA	1
DRAINAGE AREA AND CENTROID MAP	2
TOP OF DAM PROFILE	3
TYPICAL CROSS SECTIONS	4
SPILLWAY DISCHARGE RATING	5
100-YEAR DISCHARGE CALCULATION	6

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Conclusions presented herein pertain to present conditions. The effect of future development on the hydrology of the watershed has not been considered.

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject Pa. Dam Inspections

S.O. No. _____

Maggio Estate Dams

Sheet No. 1 of 7

HYDRAULIC DATA

Drawing No. _____

Computed by GDD

Checked by GWT

Date _____

DRAINAGE AREA

RALSTON QUAD. - $2070.9/3 = 690.3$ Acres = 1.08 sq. Mi.

SURFACE AREAS

LAKE SURFACE @ El. 1640 - $75.15/3 = 25.05$ Acres

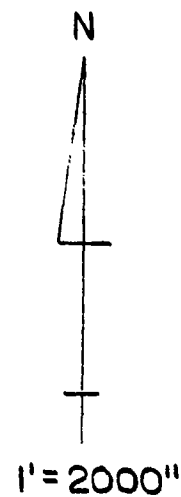
El. 1660 - $153.45/3 = 51.15$ Acres

El. 1680 - $223.05/3 = 74.35$ Acres

WATERSHED LENGTHS

L = 8,600 Ft. = 1.63 mi.

Lc = 4,450 Ft. = 0.84 mi.



RALSTON QUAD.

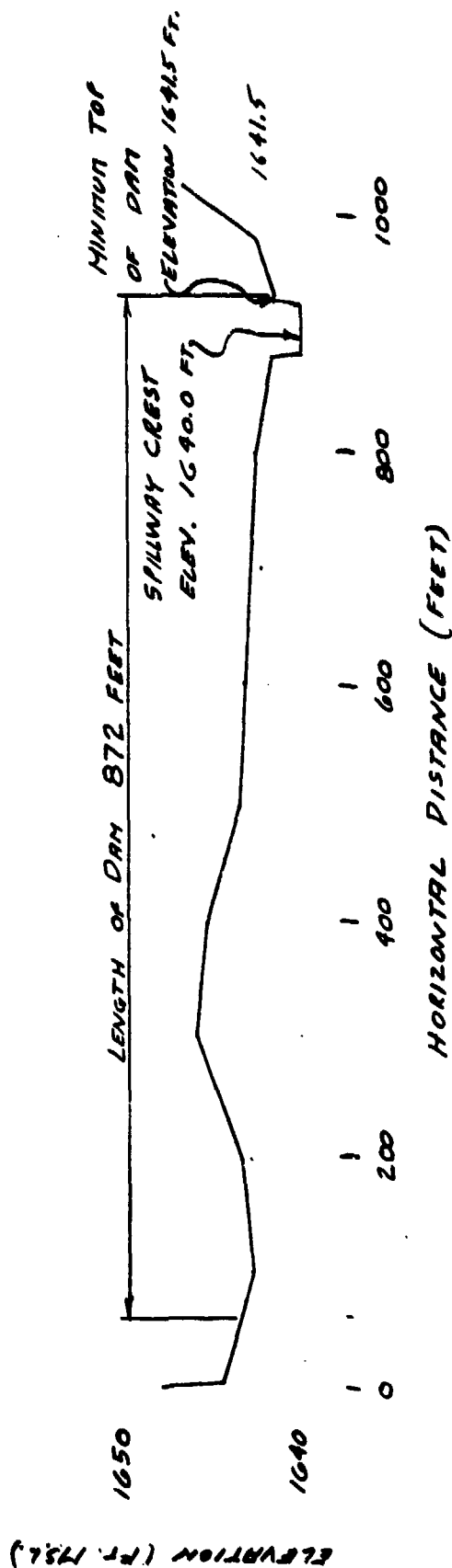
MAGGIO ESTATE DAM NO. 2
DRAINAGE AREA AND CENTROID MAP

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MAGGIO ESTATE DAM No. 2 S.O. No. _____
TOP OF DAM PROFILE Sheet No. 3 of 7
Drawing No. _____
Computed by GWT Checked by WDL Date 4/3/51

TOP OF DAM PROFILE (LOOKING DOWNSTREAM)



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Beaver, Pa. 15009

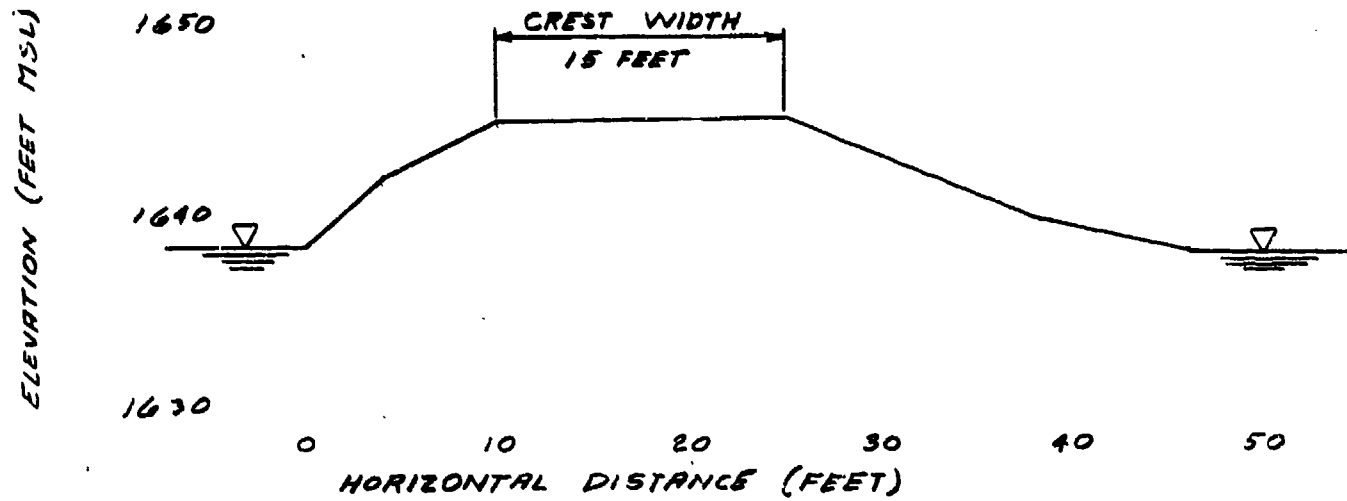
Subject MAGGIO ESTATES DAM No. 2 S.O. No. _____

TYPICAL CROSS SECTION Sheet No. 4 of 7

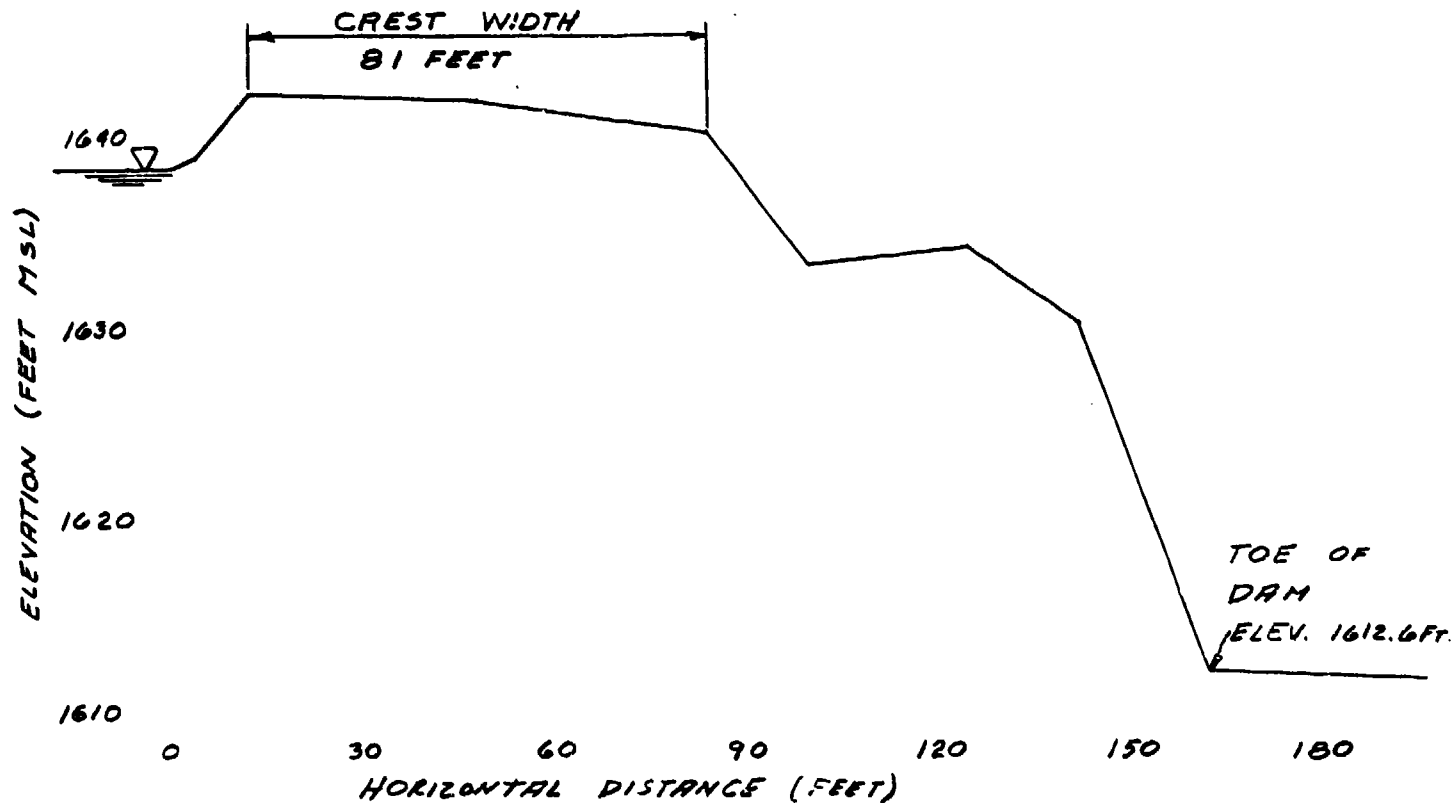
Computed by GWT Checked by WDL Drawing No. _____

Date 4/3/81

TYPICAL CROSS SECTION AT
SECTION A-A



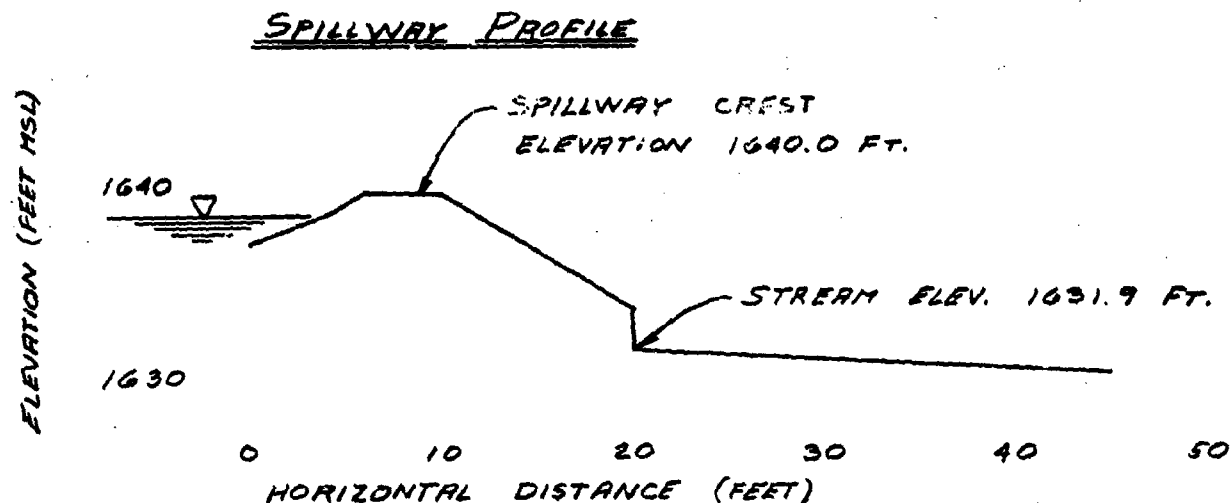
TYPICAL CROSS SECTION AT SECTION B-B



MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MAGGIE ESTATE DAM No. 2 S.O. No. _____
SPILLWAY DISCHARGE RATING Sheet No. 5 of 7
Drawing No. _____
Computed by GWT Checked by WOL Date 4/3/81



DEVELOP RATING CURVE BASED UPON CRITICAL FLOW OVER SPILLWAY:

$$V = \sqrt{gD} \quad (\text{CHOW, OPEN CHANNEL HYDRAULICS, P. 43})$$

$$g = 32.2 \text{ FT/SEC}^2$$

$$D = \text{MEAN HYDRAULIC DEPTH} = \frac{\text{FLOW AREA}}{\text{FREE SURFACE TOP WIDTH}} = \frac{A}{T}$$

$$V = \text{MEAN FLOW VELOCITY}$$

$$Q = AV$$

SPILLWAY ELEVATION, (FT)	FLOW DEPTH, (FT)	AREA (FT) ²	TOP WIDTH, (FT)	A/T	V (FT/SEC)	Q (CFS)	V ^{3/2}	RESERVOIR SURFACE, (FT)
1640.0	0	0	38.0	0	0	0	0	1640.0
1640.5	0.5	19.37	39.5	0.49	3.97	76.9	0.24	1640.74
1641.0	1.0	39.75	41.5	0.96	5.56	221.0	0.48	1641.48
1641.5	1.5	61.13	43.5	1.41	6.74	422.0	0.71	1642.21
1641.9	1.8	73.80	44.0	1.68	7.35	542.4	0.84	1642.64
1642.0	2.0	82.60	44.0	1.88	7.78	642.6	0.94	1642.94
1642.5	2.5	104.60	44.0	2.38	8.75	915.3	1.19	1643.69
1643.0	3.0	126.60	44.0	2.88	9.63	1,219.2	1.44	1644.44
1643.5	3.5	148.60	44.0	3.38	10.43	1,549.9	1.69	1645.19

SPILLWAY CAPACITY AT THE MINIMUM TOP OF DAM
(EL. 1641.5 FT.) IS 221 C.F.S.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject MAGGIO ESTATE DAM No. 2 D.O. No. _____
100-YEAR DISCHARGE CALCULATION Sheet No. 6 of 7
Drawing No. _____
Computed by GWT Checked by WDC Date 7/28/81

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL FROM "WATER RESOURCES BULLETIN, BULLETIN NO. 13, FLOODS IN PENNSYLVANIA", PREPARED BY THE DEPARTMENT OF ENVIRONMENTAL RESOURCES, COMMONWEALTH OF PENNSYLVANIA.

DRAINAGE BASIN FROM PLATE 1 - MODEL 2
REGRESSION EQUATION FROM TABLE 2

$$Q_T = CA^X$$

T = 100 YEARS

C = 564

A = DRAINAGE AREA, 1.08 SQ. MI.

X = .744

$$Q_{100} = 564 (1.08)^{.744}$$

$$Q_{100} = 597 \text{ C.F.S.}$$

THE INFLOW TO THE IMPOUNDMENT FOR THE 100-YEAR FLOOD WAS CALCULATED USING MATERIAL FROM "THE HYDROLOGIC STUDY - TROPICAL STORM AGNES" PREPARED BY THE SPECIAL STUDIES BRANCH, PLANNING DIVISION, NORTH ATLANTIC DIVISION, CORPS OF ENGINEERS, IN NEW YORK CITY.

DRAINAGE AREA - 1.08

① COMPUTE THE MEAN LOGARITHM

$$\log(Q_m) = C_m + 0.75 \log A$$

$\log(Q_m)$ = MEAN LOGARITHM OF ANNUAL FLOOD PEAKS

A = DRAINAGE AREA, SQ. MI. = 1.08

C_m = MAP COEFFICIENTS FOR MEAN LOG OF ANNUAL PEAKS FROM FIG. 21 = 2.14

$$\begin{aligned} \log(Q_m) &= 2.14 + 0.75 (\log 1.08) \\ &= 2.1651 \end{aligned}$$

② COMPUTE STANDARD DEVIATION

$$S = C_s - 0.05 (\log A)$$

S = STANDARD DEVIATION OF THE LOGARITHMS OF THE ANNUAL PEAKS.

C_s = MAP COEFFICIENT FOR STANDARD DEVIATION FROM FIG. 22 = 0.38

A = DRAINAGE AREA, SQ. MI., = 1.08

$$\begin{aligned} S &= 0.38 - 0.05 (\log 1.08) \\ &= 0.3783 \end{aligned}$$

③ SELECT SKEW COEFFICIENT FROM FIG. 23 = 0.38

$$\textcircled{4} \log(Q_{100}) = \log(Q_m) + K(P, g) S$$

$K(P, g)$ = STANDARD DEViate FOR A GIVEN EXCEEDENCE FREQUENCY PERCENTAGE (P) AND SKEW COEFFICIENT (g) FROM EXHIBIT 39 OF BEARD'S "STATISTICAL METHODS IN HYDROLOGY" 2.61

$$\begin{aligned} \log(Q_{100}) &= 2.1651 + 2.61(0.3783) \\ Q_{100} &= 1,421 \text{ C.F.S.} \end{aligned}$$

AVERAGING THE FLOW FROM THIS METHOD AND THE PREVIOUS METHOD PRODUCED A PEAK INFLOW TO THE IMPOUNDMENT OF 1010 C.F.S.

APPENDIX E

PLATES

CONTENTS

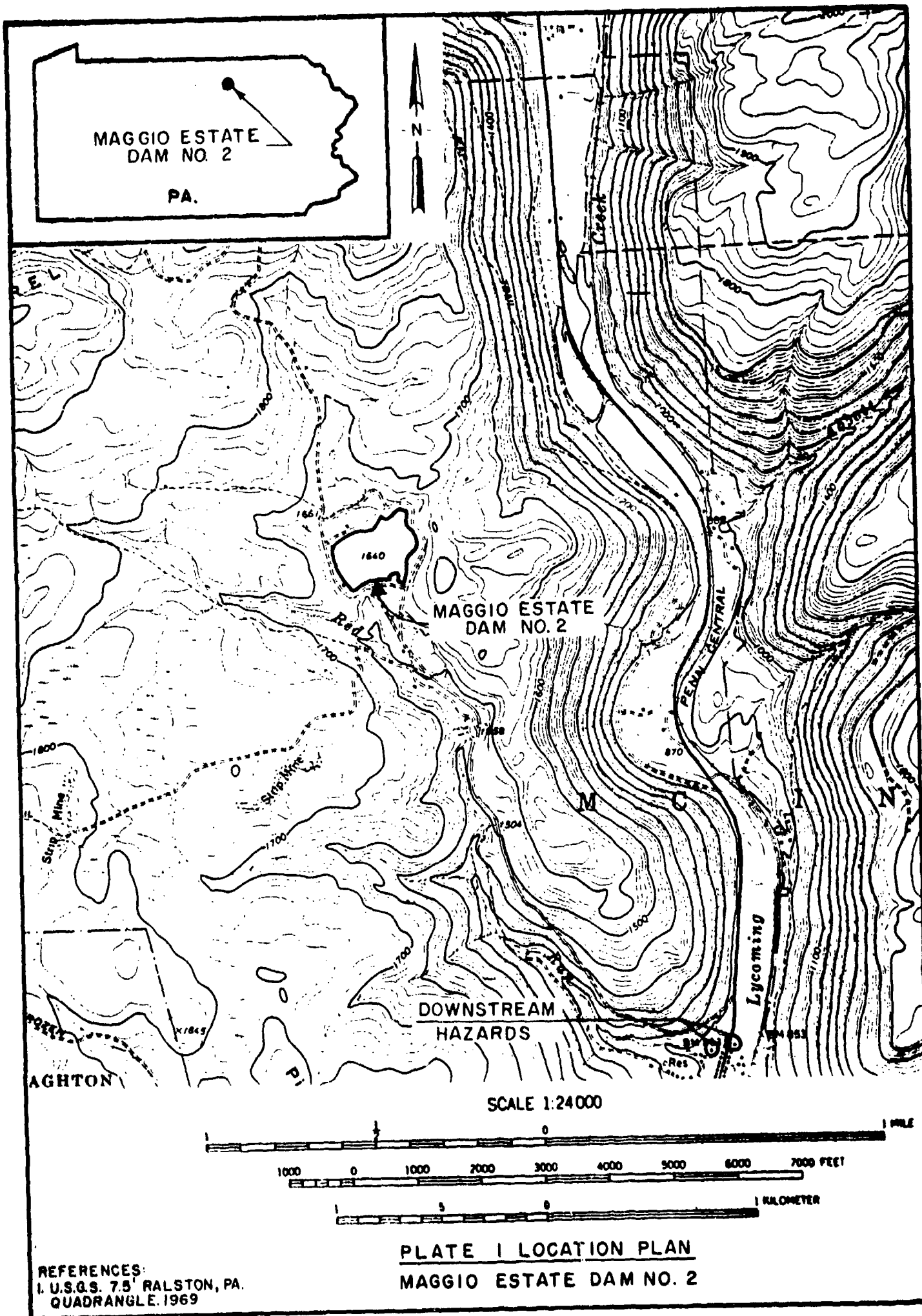
Plate 1 - Location Plan

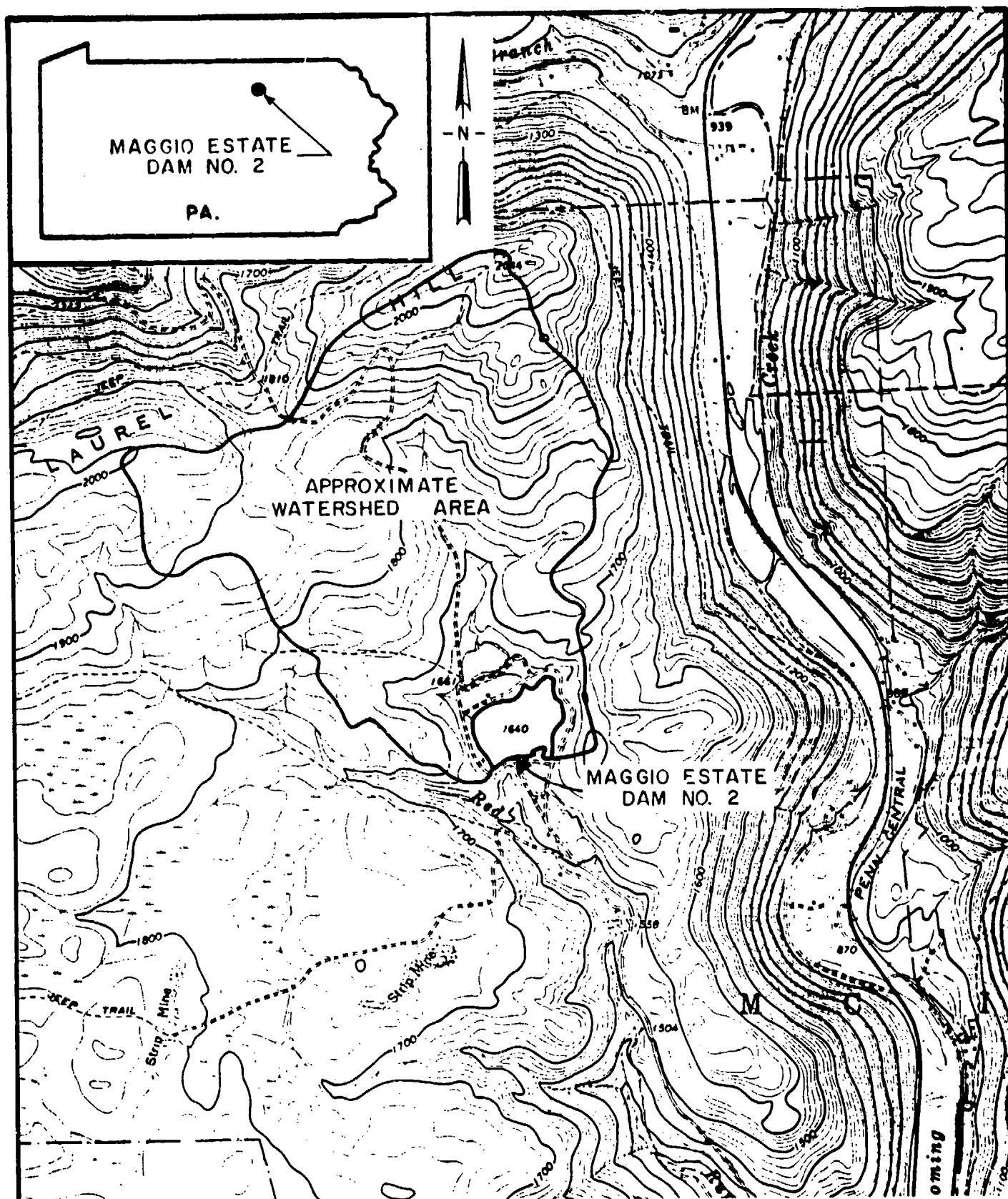
Plate 2 - Watershed Map

Plate 3 - Field Sketch

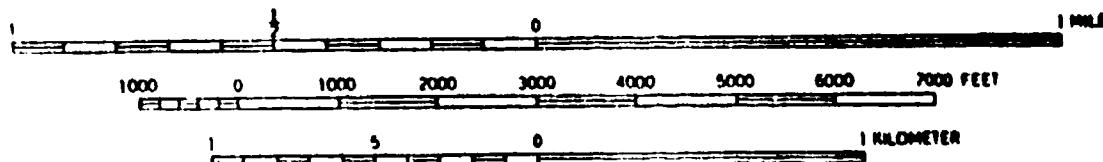
Plate 4 - Detailed Section on Through Spillway

Plate 5 - Typical Cross Section





SCALE 1:24000



REFERENCES:
1. U.S.G.S. 7.5' RALSTON, PA.
QUADRANGLE 1969

PLATE 2 WATERSHED MAP
MAGGIO ESTATE DAM NO. 2

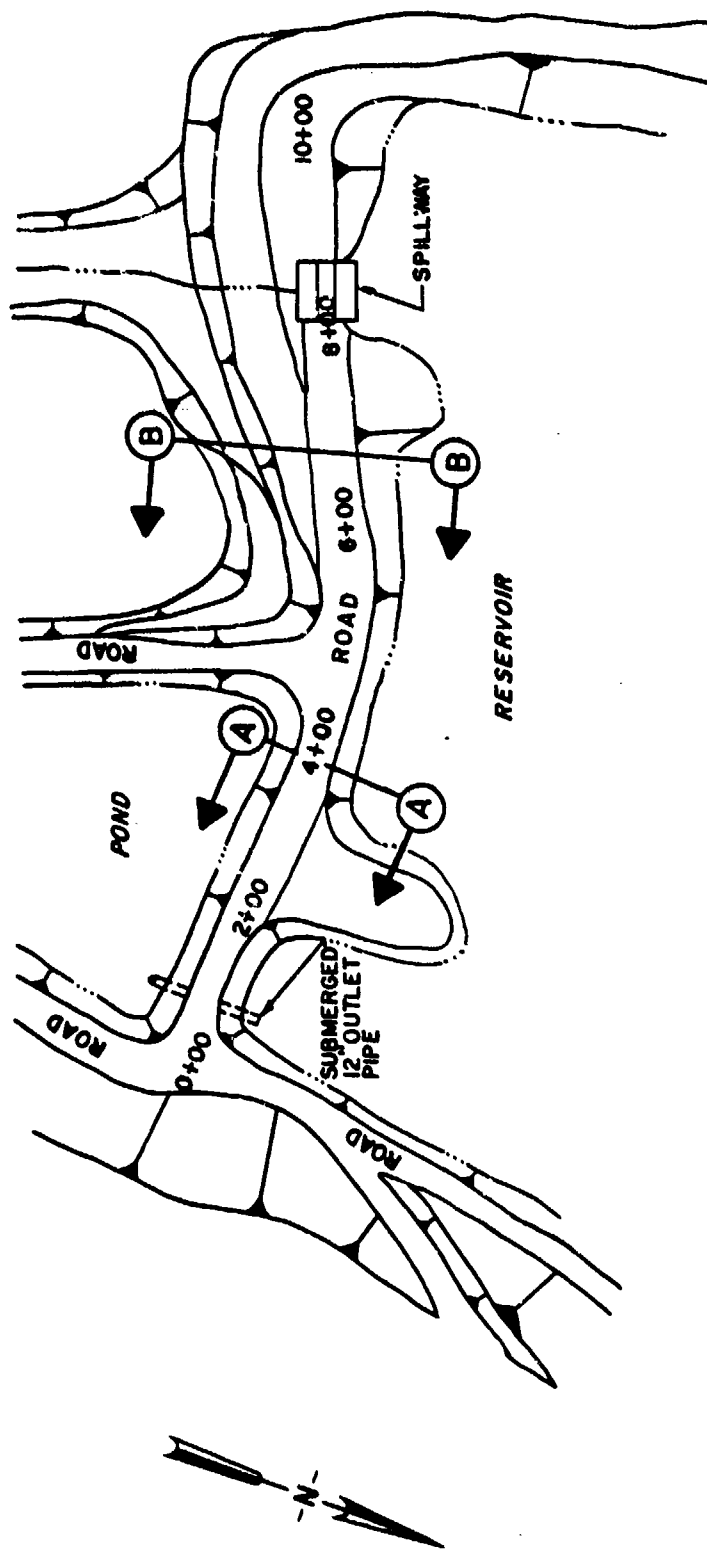
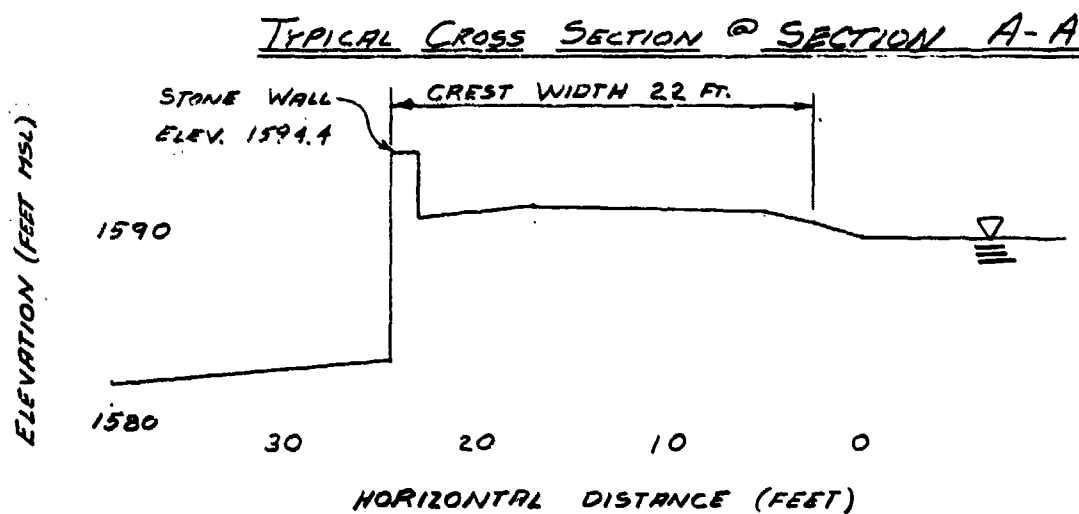
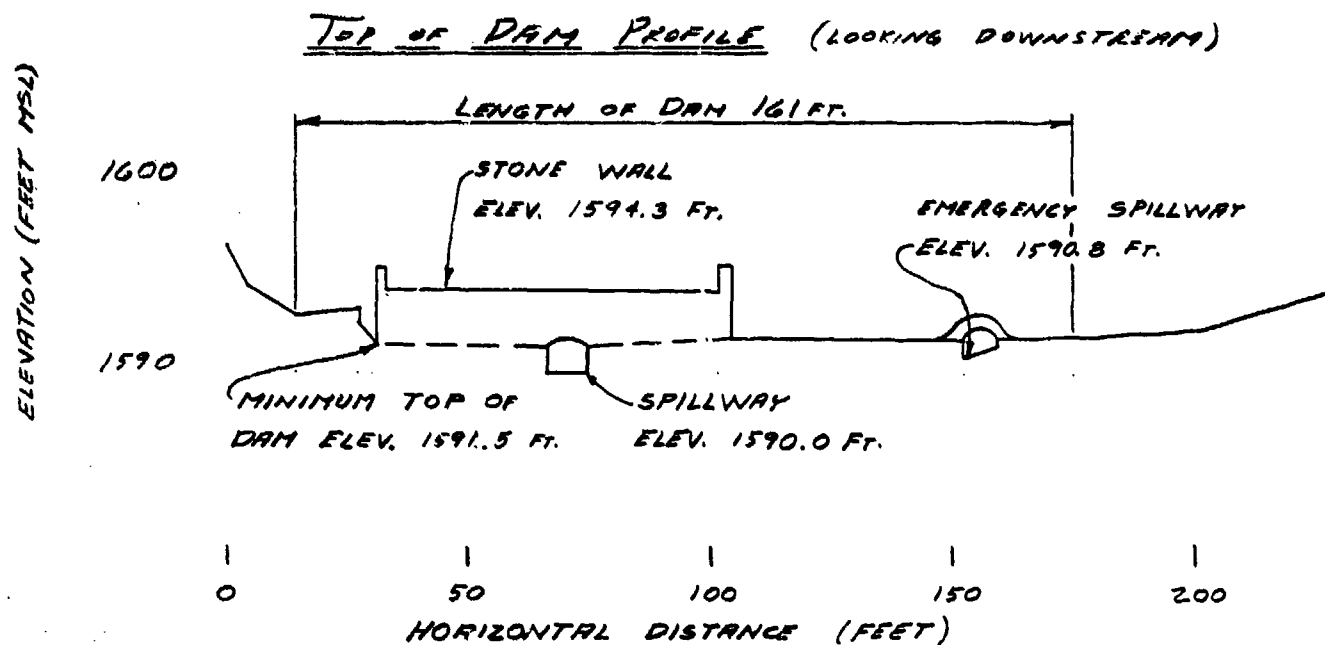


PLATE 3
 FIELD SKETCH
 MAGGIO ESTATE DAM NO. 2
 NDI NO. PA01120
 PENN. NO. 41-103
 SCHEMATIC - NOT TO SCALE

CROSS SECTION TAKEN AT SECTIONS A-A AND B-B

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009



APPENDIX F
REGIONAL GEOLOGY

Maggio Estate Dam No. 2
NDI No. PA 01120, PennDER No. 41-103

REGIONAL GEOLOGY

Maggio Estate Dam No. 2 is located in the glaciated section of the Appalachian Plateaus physiographic province. The impounded lake occupies the middle of the north fork of the Red Run stream valley. The lake is fed by drainage from a perennial stream flowing south from a lake located higher in the valley. Drainage from the Maggio Estate Dam No. 2 flows south to Lycoming Creek where it forms a confluence just north of the town of Ralston. The average topographic relief in the stream valley from the dam to Lycoming Creek is approximately 800 feet.

The study area has been glaciated at least three times and originally (prior to strip mining) was overlain by glacial ground moraine of the Nebraskan, Kansan, and Wisconsin glaciations. No test boring information was available for review; thus, the extent and thickness of the strip mine spoil is difficult to ascertain. According to the Soil Conservation Service Survey for Lycoming County, soils originally present prior to strip mining were of the Lordstown, Volusia, and Wurtsboro series. These soils are typically very stony silt loam and very stony sandy loam.

Geologic data taken from the Geologic Map of Pennsylvania indicate that bedrock in the vicinity of the lake is composed of rocks which belong to the Pennsylvania Pottsville Group and the Mississippian Pocono Group. The Mississippian Pocono Group is predominantly a gray, hard massive cross-bedded conglomerate and sandstone with some shale. The Pottsville Group is light gray to white, coarse grained sandstones and conglomerates with some mineable coal seams.



GEOLOGY MAP LEGEND

PERMIAN



Greene Formation

Cyclic sequences of sandstone, shale, red beds, limestone and coal; base at the top of the Upper Washington Limestone.

PERMIAN AND PENNSYLVANIAN



Washington Formation

Cyclic sequences of sandstone, shale, limestone and coal; some red shale; some mineable coal; base at the top of the Waynesburg Coal.

PENNSYLVANIAN

APPALACHIAN PLATEAU



Monongahela Formation

Cyclic sequences of sandstone, shale, limestone and coal; limestone prominent in northern outcrop areas; shale and sandstone increase southward; commercial coals present; base at the bottom of the Pittsburgh Coal.



Conemaugh Formation

Cyclic sequences of red and gray shales and sandstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of section; Brush Creek Limestone in lower part of section.



Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals; limestone thickens westward; Vast part Limestone in lower part of section; includes Freeport, Kittanning, and Clarion Formations.



Pottsville Group

Predominantly sandstones and conglomerates with thin shales and coals; some coals mineable locally.

ANTHRACITE REGION



Post-Pottsville Formations

Brown or gray sandstones and shales with some conglomerate and numerous mineable coals.



Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some mineable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN



Mauch Chunk Formation

Red shales with brown to greenish gray fluggy sandstones; includes Greenbrier Limestone in Fayette, Westmoreland, and Somerset counties; Loganoma Limestone at the base in southwestern Pennsylvania.



Pocono Group

Predominantly gray, hard, massive, cross-bedded conglomerates and sandstone with some shale; includes in the Appalachian Plateau Hargoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations; includes part of "Onondaga" of M. L. Potter in Potter and Tioga counties.